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Power sector reform in small island developing states: what role for renewable energy technologies?

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Abstract

Due to various pressures and desires more and more developing countries embark on power sector reform programmes. Yet, there are a wide range of reform options and at present insufficient evidence is available as to which path will deliver best the desired objectives. Presently, most Small Island Developing States (SIDS) are dependent on high-cost fossil fuel imports for power generation. In spite of evidence that harnessing abundant domestic renewable sources of energy can deliver environmental, social and economic benefits. However, depending on the type of power sector reform the transition towards renewable energy technologies (RETs) can be either undermined or facilitated. The specific focus on SIDS is justified because they have inherent characteristics that limit the degree to which the power sector can be transformed in comparison to larger continental developing countries. With specific reference to SIDS this manuscript reviews the drivers and desires for power sector reform, as well as presenting the available reform options and their implications on the uptake of RETs. In addition to elaborating aspects of market governance, other barriers to the consideration of RETs, such as financial bias in investment, human capacity and environmental policy are discussed. In view of this discussion, which is based on evidence from recent reform programmes and theoretical academic literature, recommendations are formulated that discourage full privatisation of the power sector, as well as proposing less dogmatic lending conditions by international assistance bodies.

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Contents

1. Introduction

Traditionally the electricity industry has been characterised by monopolistic conditions in developed and developing countries alike: lower electricity cost were achieved through economies of scale, derived from a centralised production infrastructure and a single transmission network executed through vertically integrated companies or para-statal entities, either regulated by government agencies or self-regulated without much supervision [1–3]. The overriding objectives were technologically in nature, such as expanding supply and improving operating efficiency, as well as guaranteeing and enhancing reliability and access [3], whilst minimising the costs of co-ordinating these objectives and financing new capacities [4].

However, a variety of pressures and developments, which are further investigated in this paper, have shifted the emphasis of energy service provision and resulted in a wide diversity of power sector reform measures since the 1980s, such as *commercialisation*, *privatisation* and *restructuring*. It is generally believed that power sector reform promotes economic growth by increasing efficiency and competition amongst market players seeking to maximise profit over relatively short time horizons [5]. In fact, there is already evidence that private sector involvement

in electricity generation has increased efficiency performance of conventional power technologies in some developing countries [1,6].

By way of contrast, Domah questions privatisation as the only desirable end goal for reform in SIDS, as recent research in Trinidad and Tobago revealed that there is no conclusive evidence as to whether or not privatised electricity generation has led to more economic production [7]. Similarly, a power sector analysis of the Dominican Republic conducted by Platt's concluded that since privatisation, the condition of the electricity sector has not improved, or possibly even deteriorated further. These observations are particularly significant given major efforts by the World Bank and governments to restructure the power sector of many small islands. In fact, Wamukonya provides numerous examples to underscore the assertion that power sector reform has failed to keep many of its promises and is likely to leave developing countries socially and economically worse off than prior to reform [8].

Although, OECD countries have spearheaded power sector reform, developing countries have and are continuing to follow suite. Latin American countries in particular were the first movers amongst developing countries, but Small Island Developing States (SIDS) have already or are in the process of reforming their electricity industry.

Amongst other developments, such as improved financing opportunities and human capacity, the combined effect of rapid technological development of Renewable Energy Technologies (RETs), abundance of Renewable Energy Resources in SIDS, and high cost of fossil fuel based electricity production on islands have led to an increased interest and/or proliferation of these technologies. They are widely regarded as being able to improve what is known as the three principal pillars of national energy policy: (i) economic efficiency, (ii) environmental performance and (iii) security and diversity of supply [9,10]. This development is particularly promising given SIDS import dependence on fossil fuel generated electricity production. However, depending on the exact nature of power sector reform it can accomplish both, either undermine or strengthen the uptake of RETs in SIDS. Given the benefits that can accrue from the propagation of RETs the former development is an undesirable outcome.

In the light of rapidly growing electricity demand in developing countries—according to the International Energy Agency installed capacity will in these countries double by 2020 [11]—there are concerns of how countries will actually expand power generation in coming decades, both financially and technologically. As compared to OECD countries, with an annual increase of 3.4% per annum over the last three decades, many SIDS have growth rates of above 5% [12]. Future electricity growth rates are predicted to be at least twice as high for developing countries as for OECD member states and require enormous investments. In Sub-Saharan Africa, for instance, the World Bank estimates a US$10 billion gap between the finances that are needed to meet electricity needs and the finances that are available from domestic and multilateral lenders [6]. Whereas Latin American countries will need investment of approximately US$466 billion into the power sector between 1990 and 2010 with an annual average spending of US$28 billion

commencing in 2000 [13]. Overall, the investment needs of developing countries into the power sector is expected to exceed that of OECD countries very shortly.

In light of this forecast it is vital that power sector reform in SIDS provides a framework in which RETs are not neglected but provided with the opportunity to play an integral role in meeting rapidly rising electricity demand. The importance of energy policy in determining future development pathways has recently been emphasised by Singh et al. [14] writing that,

> electric power reform may be a once-in-a-generation opportunity to ... stimulate renewable energy use in developing countries. But the moment of opportunity may soon pass if developing countries adopt frameworks that lock in conventional technologies and will thus lose a unique occasion to develop a clean, economically efficient power sector.

This paper begins by outlining the principle drivers, necessary preconditions, benefits and disadvantages of power sector reform, as well as the various degrees to which reform can be executed. This is complemented and put in context by analysing the differences that exist between SIDS and larger developing countries. This highlights the need for a power sector reform that is tailored towards the needs of SIDS, rather than using the experience from non-SIDS countries as a blueprint for change.

Recommendations are suggested to show how SIDS could integrate RETs, as well as simultaneously enjoy the economic and financial benefits that power sector reform can deliver. Particular importance is given to the concept of allowing *Independent Power Producers* (IPPs) under *Power Purchasing Agreements* (PPAs) to enter the market for electricity production as it has been widely argued that this concept can provide a platform from which RET projects can take off successfully. However, contrary to this belief it is highlighted that the introduction of IPPs and PPAs are neither necessarily a panacea to meet the challenges of delivering environmentally, as well as socio-economically desirable electricity services nor a guarantee for attracting contribution from RETs. Further barriers to RET integration are discussed; specifically the present imbalances in financing opportunities for RETs, as compared to fossil fuel based technologies, highlight the need for improved financing mechanisms.

2. Drivers and desires of power sector reform

A combination of economic, technological and political pressures in many developing countries has resulted in abandoning the state controlled monopolistic structure of the power sector, to seek the establishment of a framework that can meet a variety of desired goals. Both drivers and desires of power sector reform in developing countries are summarised below.

2.1. Drivers

With regards to macro-economic management of fiscal resources, as well as eliminating budgetary subsidies several key problems led to a re-thinking of power sector organisation within governments of developing countries [3,4,8,15,16]:

1. A monopolistic power sector that is generally characterised by poor performance in terms of cost, reliability and access, as well as the inability of the state to finance new power plants or maintenance.
2. Outstanding Government debts and budgetary pressures are often aggravated by direct or indirect subsidies to the electricity industry, which could aide other public expenditure needs instead and result in the desire for immediate revenue through the sale of assets from the sector.
3. In view of the above, power sector reform is often a prerequisite to access financing mechanisms from international lending institutions, such as the World Bank, as well as private investors and the only way to improve otherwise limited borrowing capacity. These reform-linked loans are generally achieved through;

(a) the establishment of transparent markets and independent regulation, as well as
(b) the separation between commercial functions of the market that require full cost recovery and the social functions of the state that require greater equity in national development.

Reform linked assistance constituted a policy shift in, for instance, World Bank and Asian Development Bank (ADB) lending conditions and was based on the assumption that private sector participation would improve enterprise performance.

In addition, power sector reform has been driven by [1];

4. technological development that challenged the concept of economies of scale and centralised production. Modern small scale generation plants with standardised modular design are competitive, less capital intensive, more efficient, quicker to build and have more sophisticated control technologies for operation and transmission networks.
5. globalisation and international trade pressures in order to remain competitive for industry and business.
6. public distrust of monopolies alongside evidence of mismanagement in some cases.

2.2. Desires

This section outlines the desired outcome of power sector reform in developing countries. However, before embarking on a reform programme necessary preconditions must be met. Principally, power sector reform should be perceived desirable, as well as politically feasible [4]. Political feasibility depends principally upon two aspects. First, the government must be convinced that legal and sometimes institutional changes required for reform are going to be successful [4,15]. Secondly, reform will almost certainly affect key stakeholders in the industry such as employees, bureaucrats and politicians, some of which may lose employment or influence.

Therefore, the majority of stakeholders with political power must see sufficient benefits to support the reform agenda [4].

Power sector reform is expected to improve the economic performance of electricity production through;

1. more efficient resource utilisation and allocation [4,15]. This is achieved where electricity prices reflect the marginal cost of production to guarantee both investment recovery and future capacity expansion [4].
2. competition and private participation [4,5]. Principally, the 'profit motive' provides companies with a stronger incentive to lower cost combinations of inputs required to produce a given output as compared to a subsidised state enterprise [4]. Therefore, in a competitive environment cost savings will be passed on to consumers improving the GDP/Energy intensity ratio.
   Further, it is argued that reform will [15];
3. improve transparency and predictability of decision making to attract long term financing.
4. provide governments the fiscal space to invest more in social sectors given private sector participation and investment.

3. Reform stages

It is argued that reform programmes are designed to progress through individual stages. At its most basic level the progression sequence advances from a state controlled monopoly, through stages of commercialisation, privatisation and restructuring towards a competitive retail sales market [3,4,17].

3.1. Commercialisation

Commercialisation is generally the first step of a power sector reform programme. The monopolistic power sector, generally recipient of direct and indirect subsidies, as well as state guarantees and alike is stripped of its benefits. Subsequently, the power utility is obliged to adhere to the same commercial objectives and rules as the private sector, such as paying taxes and market based interest rates, earn commercially competitive returns on equity capital, borrowing, labour employment and procurement [3,4]. This serves primarily two purposes. First, to recover the cost of electricity services, particularly by adjusting tariffs that better reflect production of different customer classes, improving revenue collection by introduction of more efficient metering and billing, as well as reducing theft [17]. Second, in order to interest private investors governments often forgive past debts of the state owned electricity monopoly, reduce staff, as well as providing new operating capital (ibid.).

3.2. Privatisation

Under privatisation the assets of the state-owned power sector are sold to a single or several private companies. This often includes shifting the responsibility of

new capacity investments away from the government towards private investor(s) (ibid.). This can also include the introduction of IPPs generating electricity under the conditions set out in a PPA. PPAs can be mandated either by the state (e.g. through an 'Electricity Supply Act'[1] or similar) as part of the reform programme and/or the electricity company/ies as a means of improving its own profitability.

Where several players enter the market, the introduction of competition can improve sector performance in terms of efficiency, customer responsiveness, innovation and viability [4]. However, competition is usually encouraged in the supply side segments but is rarely feasible in the network segments, such as transmission, distribution and control, because they are natural monopolies (ibid.).

Further, privatisation is generally associated with the development of economic regulation that is applied transparently by an agency operating independently from the government, electricity supplier(s) and consumers, to ensure that the tariffs allow the power producer a fair return on investment [4,17], but also to avoid abuse of monopoly/oligopoly situations [1][2].

3.3. Restructuring

Restructuring or *unbundling* the power sector is a process that seeks to vertically break up generation, transmission, distribution and retailing into different entities, as well as enabling multiple generators and distributors of power to compete with each other in a competitive wholesale power market [3,4,17]. Monopolies can also be restructured by geographically dividing parts of the service into different competitive or non competitive regions [1], which is a suitable concept for multi-island states. Simultaneously, the government should relinquish any stakeholder role in the power sector and concentrate on policy formulation and implementation. Depending on the exact nature of a liberalised market diverse configuration of wholesale[3] and retail[4] competition, as well as state regulation are possible [4].

[1] At all stages of the reform process the functioning of the electricity sector is normally ensured through an omnibus Act, often titled 'Electricity Act' [1]. Its basic laws commonly include paragraphs, that govern, for instance, the duties and responsibilities of the power company, the number of years for which the license is valid to supply power, whether and in what area it has exclusivity, financial structure, borrowing rights and procedures, the selection of the board of directors, as well as contractual powers and obligations (ibid.).

[2] Regulation is generally exercised through a regulatory authority, such as the Public Utility Commission in many Caribbean islands. The regulatory authority is usually fitted with powers to examine tariffs, set rates of return, and inspect books and records, as well as making recommendations on tariff increase/decrease (ibid.). Appointed by the Government the regulatory authority often consists of public figures from the private and public sector alike but unfortunately, it has been assumed that their decisions are often overruled in favour of political objectives (ibid.).

[3] Wholesale competition allows distributors to buy power from an electricity generator of choice and transmit electricity under open access arrangements over the grid.

[4] Retail competition allows customers to choose the power supplier who has open access to the transmission and distribution system.

4. Current situation in SIDS

At present most SIDS are extremely dependent on the import of fossil fuels for electricity generation. The combined effect of high transport costs for fossil fuel imports, a limited demand for fuels domestically and diseconomies of scale in power production, makes electricity generation not only extremely expensive but also bears financial risks in the long term [12,18–20][5]. Simultaneously, the power sector is dominated by publicly or privately owned enterprises, controlling all stages of generation, transmission and distribution with enormous control on investment decisions and programmes, employment and tariff setting [7].

Interestingly, most SIDS have the potential to make use of substantial renewable energy sources [21–23] which, as indigenous resources, do not require costly fossil fuel imports. Presently, these resources are in most cases persistently under-utilised[6]. Yet, there is evidence that RETs can assist the production of electricity at lower cost in SIDS than with diesel generators alone [23–27]. This counts for both grid connected and off-grid applications. This is particularly promising, with regards to the rapid improvement of RETs efficiency and falling purchase prices over the past decade, with further progress widely anticipated [28–32]. Besides, the proliferation of RETs can also offer social and environmental benefits, as well as enhancing the security of energy supply, in comparison to fossil fuel based energy systems [9,33–38]. Fig. 1 shows the contribution from RETs to net electricity production in SIDS.

In view of the anticipated benefits of RETs and the presently sparsely utilised potential it is important that power sector reform allows these technologies to play an integral—and in the long-run perhaps dominant—part of providing electricity in SIDS. The following sections outline the limitations of power sector reform in SIDS considering the above mentioned sequence of reform steps, thereby giving answers towards optimising limited reform capabilities.

4.1. Inherent reform limitations in SIDS

Recent power sector reform programmes around the world have sparked interest among many SIDS to adopt similar reform policies, in order to alleviate financial and budgetary pressures. While some have already commercialised and privatised the power sector, others are planning first reform steps or even restructure. However, there is significant uncertainty as to what path electricity reform should take, in particular in view of inherent limitations.

It is argued that small nations, particularly island states, do not and will not have bulk electricity markets in the near future because their absolute electricity

[5] For a detailed analysis on the economics of Electricity production in SIDS see, for instance, Weisser (2004) [63].

[6] Countries with significant contributions from hydro-electricity, such as PNG and Samoa, have already exploited all or most of the large-scale sources many years ago. Rapidly increasing electricity demand in SIDS will inevitable reduce the relative share of hydro-electricity to overall power supply.

Country	Hydro	RETs	Country	Hydro	RETs
Africa	%	%	**Asia & the Pacific**	%	%
Cape Verde	0	0	Cook Islands	0	0
Comoros	9	0	Fiji	82	0
Mauritius	9	0	Kiribati	0	0
Sao Tome and Principe	59	0	Maldives	0	0
Seychelles	0	0	Marshall Islands	N.A.	N.A.
			Micronesia	N.A.	N.A.
Latin America & Caribbean	%	%	Nauru	0	0
Antigua and Barbuda	0	0	Niue	0	0
Aruba	0	0	Palau	N.A.	N.A.
Bahamas	0	0	Papua New Guinea	46	0
Barbados	0	0	Samoa	42	0
Cuba	1	5	Singapore	0	0
Dominica	53	0	Solomon Islands	0	0
Dominican Republic	8	0	Tokelau	N.A.	0
Grenada	0	0	Tonga	0	0
Haiti	40	0	Tuvalu	N.A.	0
Jamaica	2	1	Vanuatu	0	0
Netherlands Antilles	0	0			
St. Lucia	0	0	**Europe**	%	%
St. Kitts and Nevis	0	0	Cyprus	0	0
St. Vincent & the Grenadines	31	0	Malta	0	0
Trinidad and Tobago	0	0			
United States Virgin Islands	0	0	**Western Asia**	%	%
			Bahrain	0	0

Fig. 1. Electricity generation from RETs as share of national net generation in 2001. Source: based on Data from EIA (2003) [64].

demand is too low, and therefore unable to reduce electricity prices through competition in the market [15]. Similarly, Bacon and Beasant-Jones emphasise that developing countries with capacities below approximately 1000 MW would not attract sufficient numbers of participants in generation and distribution to introduce sustained competition [4], a prerequisite for achieving more efficient production. Fig. 2 shows that the majority of SIDS have an installed capacity of well below 1000 MW.

Given the limited size of the power sector in SIDS, and thus the potential for investment revenue, wholesale markets would inevitably lead to monopolistic or oligopolistic market structures [7]. As a consequence, competition in production and distribution would not deliver the desired economic benefits as often recorded in larger developing and developed countries. In the Caribbean, investor-based power sector reform was exercised, for instance, in Grenada, Dominica and St Lucia and replaced the undesired state monopoly with a private monopoly, obviously without any economic benefits from competition.

In view of this argument another important aspect for countries, such as SIDS, with small, internal and a formal financial structure is raised by Bacon and Beasant-Jones. They highlight that privatisation as a means of macroeconomic stabilisation inevitably means foreign ownership, in part or in total, of key dom-

Country	MW	Country	MW
Africa		**Asia and the Pacific**	
Cape Verde	7	Cook Islands	10
Comoros	5	Fiji	199
Mauritius	365	Kiribati	2
Sao Tome and Principe	10	Maldives	25
Seychelles	28	Marshall Islands*	N.A.*
		Micronesia*	N.A.*
Latin America and the Caribbean		Nauru	10
Antigua and Barbuda	27	Niue	1
Aruba	90	Palau*	N.A.*
Bahamas	410	Papua New Guinea	554
Barbados	166	Samoa	25
Cuba	4486	Singapore	6730
Dominica	19	Solomon Islands	12
Dominican Republic	3081	Tokelau	200 kW
Grenada	27	Tonga	7
Haiti	240	Tuvalu*	N.A.*
Jamaica	1383	Vanuatu	11
Netherlands Antilles	210		
St. Lucia	22	**Europe**	
St. Kitts and Nevis	16	Cyprus	737
St. Vincent and the Grenadines	14	Malta	250
Trinidad and Tobago	1417		
United States Virgin Islands	323	**Western Asia**	
		Bahrain	1110

Fig. 2. Installed power capacity in SIDS for 2001. Source: based on EIA (2003) [64] and UNESCO (2003). ∗No specific information is available but installed capacities are well below 1000 MW.

estic sectors and may be perceived as less desirable as an austere stabilisation package [39] from an international lending institution. Although privatising assets allow domestic enterprises to enter a tender, at least in theory, foreign domination is common due superiority of access to finance and capital [8]. In addition to supply security implications in the future, foreign ownership can also result in capital outflow, which can weigh particularly heavy on economies where the ratio of electricity consumption as share of GDP is very high. As company shares are likely to be held in foreign hands dividends are received and spent abroad and can not be reinvested into the local economy. Where the growth of electricity consumption outstrips that of GDP, as recorded in many SIDS, this situation will worsen.

A recent sustainable energy seminar sponsored by the EC for African, Caribbean and Pacific (ACP) island states concluded similarly, stressing that it is not considered appropriate to privatise the power sector since the markets are too small to support competition [40]. Instead a viable alternative to privatisation can sometimes be *commercialisation* (or *corporatisation*) in which a private company takes over the state monopoly with clearly defined public service obligations and with the government as the only stakeholder. Moreover, it was highlighted that private investment is unlikely to be attracted to support energy service provision in remote

small islands or remote island regions, since there is little opportunity for profit making in small markets with 'poor' [sic] customers. Yet it were subsidised and state controlled power markets in developing countries that in many cases brought socio-economic benefits to isolated communities through rural 'electrification' programmes—unlikely in a privatised market [1].

However, it is envisaged that some more appropriate opportunities for private sector investment can be achieved through independent power production, for instance RETs, in particular on larger SIDS. Based on the same arguments, Kozloff believes that single-buyer models, in which independent generators sell to a single power procurement business, are appropriate for smaller systems, where the potential gains from competition are too limited to offset transaction cost [17].

Geographic isolation also means that most SIDS do not have the physical options for grid-connection with a continental power system. In which case SIDS energy demand would probably be met through intercontinental grid connection due to cheaper production from economies of scale power production in larger economies [7]. In this regard, Mayer shows that most Caribbean and Pacific islands, unable to tab from an intercontinental grid, (must) have significantly larger reserve margins in order to meet particular reliability criteria with subsequent impact on cost [19].

Therefore, it seems obvious that SIDS do not have the opportunity to unbundle the power sector and create competition in bulk power generation. Although power production can be split geographically with different power providers servicing the electricity needs on individual islands. SIDS are thus left with the option of privatising or commercialising the previously state controlled monopolistic power sector, often through public ownership or investor-based reform designs. The extent to which economic efficiency gains can be realised depends on the exact nature of the regulatory framework in which a power provider has to operate. Traditionally, this will not bring about a transition towards other fuel sources but remain reliant on fossil fuel based technologies. Although RETs are likely to lower overall production costs, to date no significant contributions from these technologies have been achieved under past and present power sector frameworks in SIDS. Unless for countries with large-hydro potential such as Papua New Guinea, Samoa, Dominica and St Vincent and The Grenadines. However, power sector reform can be extended to include power production from RETs through independent producers. However, a range of measures need to be taken to ensure that independent power production can take off and deliver the anticipated economic benefits.

4.2. Problems, preconditions and pitfalls

Many SIDS governments continue to endorse policies that promote power generation from fossil fuels [41,42]. Consequently, alternatives to fossil fuel generators are rarely examined analytically. Even where commercialisation and privatisation has been exercised, direct and indirect subsidies still exist for conventional power generation technologies giving them a head start over RETs. And besides skewing

energy supply choices, subsidised electricity prices not only encourage wasteful consumption but also discourage demand for efficient electric appliances [43]. By and large, this sends wrong price signals to consumers and producers, as well as undermining private investments and businesses in new markets [3,44][7] thereby leading to misallocation of investments [28,45]. Resultantly, subsidies are unlikely to develop sustainable markets unless they create conditions whereby they are no longer needed (i.e. smart subsidies). Therefore, any power sector reform program needs to correct these biases to allow competition on equal footing.

Power sector reform, particularly the reform stages *privatisation* and *restructuring*, may result in market conditions that do not lead to diversification and security of energy supply in the short-, medium-, and long run, unless of course provisions are mandated in regulation or government acts. It is therefore clear that short-term profit maximisation of privatised enterprises can conflict with long-term governmental energy planning goals [5]. For instance, while reforming the power sector, socio-environmental considerations are often ignored, either because decision makers perceive priorities elsewhere, or because they presume that reform will automatically lead to environmental improvement [3,17][8]. Therefore, comparable socio-environmental standards on all generating technologies should be enforced, ideally at the time of power sector changes due to maximum political momentum for reform [3,44]. Government policy can achieve this either via regulation or incentives to allow non economic goals to be realised. Similarly, government policies need to ensure that energy supply security is pursued even in circumstances where traditional accounting methods, such as discounted cashflow analysis, would recommend otherwise [2]. Although, imposing too many conditions and constraints may impede private investment and/or participation in the power sector. It is therefore important to carefully balance the financial and budgetary benefits that are expected from privatisation against the long-term socio-economic and environmental detriments that can arise from unconstrained market conditions and private investor biased regulatory frameworks.

The reasons that RETs are neglected in electricity planning are manifold and not only due to inadequate policy frameworks that govern the way a country's energy economy and electricity tariffs are structured and organised [21,40,46–49]. This is often impeded by the inherent interests of senior officials of public/private utilities or electricity boards to promote energy technologies that lie within their own area of expertise—traditionally conventional engineering or similar. These institutional obstacles and bureaucratic resistance to the consideration of RETs need to be removed.

[7] Although, subsidies can be used to create initial market volume, such as the electricity feed law in Germany which has encouraged an unprecedented growth of installed wind capacity, it may always be necessary for poorer segments of society [44].

[8] Although it could be argued that commercialisation or privatisation probably leads to higher efficiency of thermal power plants, more benign technologies such as RETs would further improve environmental performance.

It has long been recognised that a lack of qualified personnel being trained as energy policy-makers, energy planners, project organisers, energy economists, energy managers, engineers and technicians, remain a constant obstacle to providing a balanced assessment of planning choices [50]. In this respect a United Nations report stresses that the development of renewable energy sources will depend not only on the choice of appropriate technology, but on capacity building through the adequate development of managerial and technical expertise, careful financial management and adoption of appropriate institutional approaches [33].

In addition, further lessons emerged from power sector reform programmes in developing countries that should not be ignored but need to be carefully analysed prior to reform stages in order to avoid repeating the mistakes and inadequacies of reform and novel regulatory frameworks. In particular, it has been stressed by the World Bank that in order to maintain control of the reform process that the pace at which this is pursued should be directly related to the stakeholders' ability to adapt to a changing regulatory framework, as well as allowing careful assessment of the potential outcomes of reform [8]. This is especially important given the difficulty of reversing reform processes once they are underway (ibid.), as well as alienating domestic and foreign investors. However, careful planning and execution of reform is often inadequate due to urgent needs of meeting fast rising electricity demand. And because power sector reform in developing countries is necessary to access funding/loans from international lending institutions, such as the World Bank, and often the only way to overcome severe financing difficulties hasty decisions are often inevitable.

Another principal driver of power sector reform was the expectation that private participation would relieve budgetary pressure and allow improved spending for alternative social projects. However, it is argued that private enterprises have often not been financially independent and frequently used the government as guarantor for projects and thereby putting the public sector at risk (ibid.). In these circumstances potential profits of power sector reform can be privatised whereas losses are covered at the tax-payers expense. Similarly, the sale of public assets have often fallen short of their 'real' value, which is often defended by 'reformists' arguing that the private sector relieves the government of future investments which should be equated as revenue in present terms (ibid.). Yet, private participation does not always result in the necessary investments for new power capacities or infrastructure projects, such as recently exposed by California's and north-east American power shortages and blackout respectively. Equally, power sector reform in India during the 1990s, for instance, has only resulted in less than half the capacity expansion necessary to meet rising electricity demand (ibid.).

Although power sector reform, in the form of commercialisation and privatisation, has frequently improved efficiency in production, transmission and reliability, tariffs have inevitably increased in order meet cost recovery benchmarks with subsequent detrimental effects on poorer segments of society. Likewise, rural electrification is rarely financially attractive but urgently needed as a means to stimulate socio-economic development. Although, it is argued that distributed gen-

eration, in particular in the form of RETs, in rural areas is economically more effective in comparison with grid extension, it presupposes that the cost can be covered by the communities they intend to serve (ibid). With regards to this the World Bank reported that without incentive programmes rural or poor communities would remain without electricity (ibid.), thereby undermining the credibility and effectiveness of the reform-linked financial assistance policy by many multilateral lending institutions.

4.2.1. Financing struggles

As already outlined above, commercialisation and privatisation is principally pursued in order to attract investors and/or new financing opportunities for power projects. Financing opportunities, in particular with regards to RETs, are particularly important as they are essentially controlled by exogenous entities, in a sense that an outside financial body is necessary to realise the financing side of the project. Although power sector reform can improve financial credibility endogenously it will certainly not improve the perceived risk that financing institutions have over RETs. *Borrower commitment* is constrained by lack of familiarity, lack of understanding of the costs and benefits and international experience, perceptions of perceived risk, and entrenched political interest which bias decision makers towards conventional energy technologies [51]. Hence, there is an imbalance between what may be perceived the most desirable and/or most economic strategy for capacity expansion for commercialised or private enterprises and how power sector financing strategies can be realised given available financing possibilities.

During the 1980s commercial banks have been the most important financing institutions for power projects but were gradually replaced by multilateral banks, bilateral financing institutions and international lending bodies during the early 1990s [13]. Similarly, support for RETs has been growing amongst governments, supranational and non-governmental organisations but today investment patterns are slowly shifting away from traditional governments and lending institutions towards financing from private firms and banks [44].

But both, international lending institutions as well as private financial bodies appear to be biased against RETs in comparison with conventional energy technologies, and some of the reasons for this situation are elaborated below. Singh, for instance, highlights conflicting objectives within the World Bank Group's spending, emphasising that they have granted one hundred times more money towards fossil fuel development than the Global Environment Facility[9] on cutting greenhouse gas emissions [14]. Although it needs to be emphasised that the GEF can only commit financial resources equal to the amount it receives through donor contributions for

[9] Together with the United Nations Development Programme and the United Nations Environment Program the World Bank is the implementing agency of the GEF. The GEF provides new and additional grants and concessional funding to meet the incremental costs of measures to achieve agreed global environmental benefits in four focal areas: Climate change; Biological diversity; International waters; and Ozone layer depletion.

	Fossil Fuel Infrastructure US$ billion	**RETs** US$ billion
World Bank Group*	25	1.35[1]
U.S. OPIC & EIB**	32	1.3

Fig. 3. Financing disparity for power technologies in developing countries. Source: *[51,52]; **[53]. [1]Please note that it is assumed that the US$ 1.35 billion provided by the World Bank Group in form of loans, grants and credits leveraged total project cost of approximately US$ 4 billion (51).

the GEF trust. Summarising financial contributions by the World Bank Group, the US Overseas Private Investment Corporation and the US Export-Import to support energy projects in developing countries. Fig. 3 indicates a bias towards fossil fuel technologies for the time periods 1992–2002 and 1992–2000 respectively.

This disparity has been strengthened additionally by unequal allocation of research and development budgets for fossil fuel technologies and RETs in the past. Virtually all modern power technologies are designed in developed countries and are adopted in the developing world due to their limited capacity to invest in RD&D programmes. Consequently, developing countries are takers of technology options. Fig. 4 shows the difference in RD&D budgets in IEA countries during most of the 1980s and 1990s and highlight the historic financial advantage given to the development of fossil fuel technologies, in spite off the devastating effects of the world oil crises in the 1970s and 1980s on global economic development. In view of this funding support it comes at no surprise that fossil fuel based power technologies is the dominant choice in energy production in developing countries, in particular given the limited access to nuclear power technology.

Further financial barriers, which may also help to explain, at least in part, the stark contrast between financing fossil fuel technologies and RETs, include [51];

1. energy prices that are too low for RETs to compete on economic grounds (this may or may not be aggravated by direct or indirect subsidies to conventional fuel technologies).

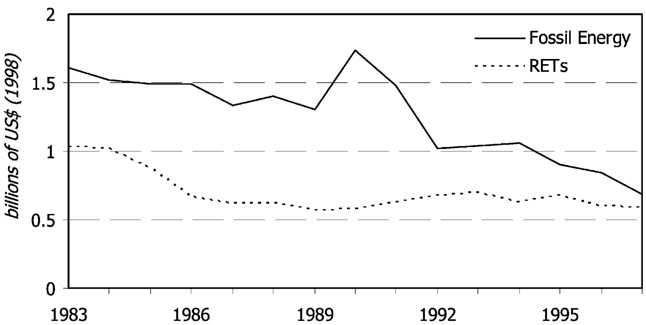


Fig. 4. Reported research and development spending in IEA countries. Source: based on World Energy Assessment (2000).

2. hesitant Ministries of Finance due to lack of knowledge of RETs are reluctant to provide guarantees or to trust new financing arrangements.
3. countries' opposition to borrow funds for RET development when bilateral grant money can be received for conventional technologies.
4. a lack of confidence in RETs since a series of project failures in the 1970s and 1980s[10] and a presently limited technological track record in developing countries.
   In addition, a very elaborate analysis by Redlinger et al on more detailed aspects of financing RETs projects highlights that [54];
5. the debt service coverage ratio (DSCR), defined as the ratio between the cash flow arising from a project in any given year and the amount of cash necessary to service all debt payments in that year, is much more favourable for conventional technologies than it is for RETs. Since the DSCR indicates a project's ability to meet its annual debt service obligations it is an important criteria for investment decisions.[11]
6. differences in project- and corporate-financing mechanisms have a tangible effect on the viability of projects. The cost of capital for private-project financing tends to be significantly higher as only the project's own revenue stream can be used to service the debt obligations. By way of contrast, under corporate-project financing a company's entire assets and revenue stream serve as collateral for financing a project. In particular with a view on the high up-front capital cost of RETs corporate-finance is favourable over private-finance for the development of power projects. To date, most IPPs are likely to operate under project-financing and hence face a barrier to cheaper financing which is generally available to larger utilities, in particular for conventional power projects.
7. all power development projects involve substantial transactions costs. These are usually similar whether they are small modular RETs, such as a 1 MW wind turbine or a 7 MW diesel generator. Therefore, the transactions cost for a series of RETs would be much higher than for a single large fossil fuel technology and add to already high up front capital cost of modern RETs. Significant economies of scale therefore exist with regards to transaction costs and place RETs at a disadvantage, unless the advantage of modularity is given up in place of larger RET parks.

However, it needs to be emphasised that the imbalance in financing opportunities is also crucially influenced by the overall demand of seeking finance for RET

[10] It is argued that project failure was not primarily a result of deficient technology but a lack of maintenance, repair and adequately trained personnel. Further, donated capital has frequently undermined market machanisms and as a result equipment maintenance has been neglected with corroding effects on the respective technologies [44].

[11] Referring to a study conducted by Wiser & Kahn, Redlinger et al. state that a financial lender expects the DSCR to be in the region of around 1.2–1.25 for IPP gas-fired projects, whereas wind turbine developments are expected to have a ratio of at least 1.4, thereby reflecting its higher risk, both real and perceived [54].

projects. Presently, this is strongly influenced by the endogenous barriers that prevent the proliferation of RETs within the power sector of developing countries as outlined further above.

4.3. What does it mean for RETs?

Depending on the intricacies of power sector reform a country's future technology portfolio, fuel mix, greenhouse gas emission accounts and the cost to the consumer can be affected significantly. It is argued that power sector reform aiming to adopt market-oriented prices and deregulated supply structures could offer RETs the opportunity to compete with conventional power technologies for market share for the first time [17,28,55,56]. However, further obstacles need to be overcome for RETs to be considered a viable alternative to fossil fuel technologies.

Fuchs et al. argue that the long tradition and maturity of centralised electricity generation from conventional technologies can be a significant barrier to the introduction of RETs [57]. They emphasise the restrictions of intermittent RETs regarding their operation and control and the necessity for additional technology, such as storage components, in order to maintain reliability of supply. In particular, a high penetration of intermittent RETs creates a challenge when designing and conceptualising a reliable system [58]. To date, most planners are familiar with capacity planning based on physical and observable reserve margins which is unsuitable for assessing the operational reliability of RETs [59]. By way of contrast, conventional energy technologies are very controllable and manageable from both, a technological and economic point of view [57]. It is of these difficulties that Fuchs et al. conclude that liberalisation is likely to support the development of traditional power technologies, especially,

> as the economic logic of the liberalised market will increasingly force power generators to rely on the dominant technological trajectories to innovate power generation technology.

Similarly, Pandey notes that under privatisation an increase in interest rate implies that the cost of capital of a technology will play a more important role than its running cost in determining competitiveness [16]. Resultantly, RETs with relatively high capital cost compared to conventional power technologies, but far lower operating costs will find less consideration in the technology production portfolio. In this regard, Pandey refers to a study by Bunn and Valhos who rightly predicted a shift from lower capital-intensive gas-turbine technology as compared to coal fired power plants. In the UK this rapid energy sources transition as a consequence of market liberalisation is generally referred to as 'Dash for Gas'.

By way of contrast, Martinot argues that the economic advantages that traditional regulated monopoly utilities enjoyed from large power plants and increasing economies of scale are being diminished by new technologies, such as RETs, that are cost competitive and more efficient at increasingly smaller scale [3]. With a view on the fact that most SIDS could not even develop economies of scale in power production due to limited demand and capacity the advantages of RETs are

likely to be even stronger. In this regard Martinot emphasises that new technologies actually reduce investment risks and thus costs at smaller scales by providing modular and rapid 'just in time' capacity increments [3]. However, limited human capacity and financing mechanisms currently undermine this potential to be fully developed.

With regards to the two principal reform stages that are most appropriate to SIDS, *commercialisation* and *privatisation*, Kozloff argues [17], that:

Commercialisation has the potential to facilitate the introduction of RETs in the distributed market. In particular, as utilities are required to recover the cost of serving isolated rural areas or islands, they are more likely to identify the least costly manner of extending energy services.

Already there is evidence that RETs can generate electricity at lower cost in isolated areas/islands than conventional technologies [23–27], and consequently RETs have the potential to proliferate under commercialisation. Especially the multi-island states of the Pacific, as compared to the primarily single and two island states of the Caribbean, are likely to find RETs economically advantageous over fossil fuel technologies, due to the wide dispersion of low electricity load centres and the economic advantages of RETs in these conditions.

For bulk power markets, Kozloff assumes that commercialisation will have little effect, other than improving the utilities ability to adopt new technologies. RETs may be considered to the extent that improved management, cost accounting and recovery increases the utility's interest in choosing the least-cost approach to expanding services on a life-cycle basis.

Privatisation may impair the uptake for distributed and grid-connected RETs. Primarily, private energy suppliers are likely to face higher interest rates than government entities, and will therefore prefer conventional energy options—with lower up-front capital cost as compared to most modern RETs—with a more rapid rate of return. Particularly, with a view on the financing advantages that conventional technologies have over RETs. Furthermore, private companies are less likely to care about 'social objectives', such as environmental protection, as well as security and diversity of energy supply and therefore unlikely to consider these advantages in project appraisals. In particular, rural or isolated markets are likely to be neglected due to their limited demand and profitability, unless required by regulation.

In addition to Kozloff's arguments, it is reasonable to infer that a privatised monopolistic utility may also have no interest in supporting RETs if, for instance, the holding company or the company itself is related or owns a conventional power technology company. The utility will therefore aim to buy new generating capacities 'in house', rather than investing its money with another company. Such is the case, for instance, in Grenada, West Indies, where the parent company of the privatised electric utility, WRB, has ownership links to Caterpillar which in turn provides new generating capacities to meet the islands growing electricity demand. This is a classic example of exercising monopoly power of a vertically integrated company structure, inhibiting fair competition.

Reform	Effects in Bulk Power Markets	Effects in Distributed Markets
Commercialisation	Greater attention to socio-env. implications of power production (+)	Greater sensitivity to cost recovery favours grid support and demand side applications (+)
Priavatisation	Higher discount rates favour lower up front capital costs (-) Power Purchase terms favour development of non-renewable generation (-)	Decreased interest by utility in serving unelectrified rural areas (-) Tariff reform improves end-user price signals to consider off-grid and demand side applications (+)
Unbundling	Contract terms may or may not allow renewables greater transmission access (~)	Ability to capture system benefits from deploying distributed resources depends on structure and tariff regulation (~)

Fig. 5. Consequences of reform on the uptake of RETs. Source: Kozloff (1998).

In view of the above (see Fig. 5 for a summary of Kozloff's arguments), it is paramount that capacity building enables a balanced assessment of planning choices for capacity expansion in the future that considers the long-term socio-economic and environmental objective. Therefore, energy policy-makers, energy planners, project organisers, energy economists, energy managers, engineers and technicians with an expertise in RETs are needed, who in turn can ensure this regulatory framework and make the right decisions at the planning stages of capacity expansion. For some time it has been emphasised that a lack of awareness and knowledge of existing RET options, as well as inadequate institutional and human resource capacities have resulted in inadequate consideration given to alternatives of fossil fuel based power generation technologies [21,22,40,46,48].

4.4. IPPs and PPAs: safeguarding contribution from RETs

It has been outlined that commercialisation and privatisation in the power sector are necessary reform steps to improve, for instance, financial and economic pressures, foreign direct investment, financing credibility and operating performance of the supply system.

However, commercialisation and privatisation may not result in RETs to be adopted even where they may be more economically and financially viable in comparison to conventional technologies. Provided that specific provisions from RETs are not mandated in the regulatory framework a monopolistic commercial or privatised enterprise can simply neglect RETs for various internal or external reasons. Therefore, one approach to weaken the dominance of conventional power technologies, or rather to strengthen more desirable technologies, is to modify the selection environment (i.e. the economic, technological and regulatory framework) of the dominant technology and increase the uptake and development of a variety of new technologies [57]. Equally, PPAs need to be drafted in ways that avoid biases against participation from RETs in bulk power markets [17].

Even though SIDS are considered to have a too limited absolute demand to enable competition for bulk electricity generation, competition amongst and contribution from small-scale modular RETs can be created by allowing IPPs to sell electricity under conditions set out in predetermined PPAs to the sole principal

island utility or directly by wheeling it over the transmission network to a third party. However, without a specific mandate in the regulatory framework or electricity act, that allows IPPs to sell electricity to the sole distributor or bulk generator RETs will not be able to contribute as effectively to generation as possible. Although, privatised or commercialised enterprises have the opportunity to include them in their generation portfolio, which some have already done, many barriers, as discussed above, may prevent them from doing so. Further, their in-house expertise with regards to RETs is limited and allowing IPPs to contribute to national production can create open competition for the most economic generation of electricity from RETs. This is a similar concept of deriving economic efficiency from liberalising bulk electricity generation. Further, IPPs are likely to have experience in financing, as well as operating and maintaining projects of this kind and this can certainly improve the economics and financial aspects.

4.4.1. Benefits and complications of IPPs and PPAs

Given the limitations of SIDS to liberalise their power sector it is important to ensure that RETs can contribute to the power production portfolio given their advantages over conventional technologies in improving environmental performance, security of supply and often economics.

In this regard it is argued that for grid-connected RETs an essential first step towards creating incentives and a market for renewable energy is the creation of regulatory frameworks that allow fair competition or tender for power production from IPPs, as well as ensuring PPAs and a transparent and stable electricity tariff regime [3,44,51]. In fact, prior to privatising the power sector IPPs are often the first private investors in a state controlled power market and can catalyse the reform process by demonstrating the benefits of private investment and operation [4]. Further, it is assumed that the introduction of IPPs/PPAs is a politically unproblematic first reform step because it is relatively easy to introduce by governments without losing control of existing power sector assets and employment conditions [60].

The introduction of IPPs can lead to a range of beneficial outcomes [3,4], such as:

- reducing the financial constraints of the utility to expand power capacities
- higher efficiency from generation
- lower transmission and distribution losses per unit of load as generation becomes closer to electricity loads
- reduced emissions as a result of modern small-scale generation technologies, in particular as they usually incorporate co-generation, natural gas or RETs
- proliferation of RETs, especially where feed-in subsidies exist
- improving security and diversity of supply

However, there are also difficulties that need to be recognised early in the process of formulating the regulatory framework in order to avoid disappointment at both the implementing and operating stage of IPPs and PPAs.

The difference between project-financing and corporate-financing has already been discussed. Grid connected RET IPPs can typically be project-financed only and have created a barrier for investment. However, recent financing mechanisms provided by the World Bank have helped to overcome this problem and is indication that new financing arrangements by lenders can facilitate IPP/PPA frameworks [3]. In Sri Lanka, for instance, the Energy Services Delivery Project had attracted 21 MW of small hydro-power during 1997 and 1999 under IPP policy regulation, which included standardised non-negotiable power purchase tariffs and contracts [3,51]. However, the Sri Lankan example also provides ample evidence of the importance to provide stable long term PPAs. PPAs were bound to short-term avoided cost[12] of production but a sudden slump in the border import price of oil the electricity utility reduced the PPA tariff by approximately 30% which resulted in a sudden halt of IPP investment [3,44]. Similarly, Bacon and Beasant-Jones [4] provide a detailed analysis of financial and monetary problems that can be caused by unanticipated large currency devaluation which create an unbearable upward pressure on utilities' retail tariffs. Cumulative obligations by a utility under PPAs can inflict serious financial risk when, for instance, currencies are devalued but retail power tariffs are not allowed to increase accordingly, such as during the 1998 financial crisis in Asia.

As regards avoided cost, Redlinger et al. are in agreement with the above example, stating that

> mandating that utilities purchase power at their avoided cost is not in itself sufficient for successfully promoting renewable energy; determining an appropriate level of avoided costs is similarly important.

Avoided costs appear to be based on a straight forward concept. However, determining stable long term PPAs is a complicated task, given that they need to be based on assumptions of future border import price of fuel and other indicators determining marginal cost of production. Ideally PPAs should be stable/predetermined for at least 15 years to provide a secure investment environment to IPPs. In circumstances, such as in the Sri Lankan case study, if the avoided costs are not sufficiently high, RETs projects remain unable to compete against conventional technologies, and further incentives may be necessary [54].

Related to avoided costs is another complication: that of capacity credit. Martinot argues that, to date, PPAs in developing countries only consider the energy delivered but tariffs should be structured in such a way that IPPs receive credit for the value they create, both in terms of energy and capacity [3]. However, determining the capacity credit for intermittent RETs is a complicated exercise given its non-dispatchability. Wind energy conversion technologies (WECT), in SIDS for instance, can probably not expect to receive any capacity credit due to periods of no wind. By way of contrast, solar technologies will certainly create

[12] Avoided costs are based on the marginal unit cost the utility could avoid purchasing the power from the IPP.

some capacity, even during overcast days, which will make a certain minimum amount of their energy production dispatchable. Provided, of course, that solar output coincides with peak electricity demand. Similarly, some power output is available from most small-hydro power projects, and PPAs should address this aspect by ensuring provisions for capacity credits where they can be estimated. Non-seasonal biomass and/or waste projects are dispatchable power technologies and would benefit most from a framework that ensures capacity credit payments. Therefore, covering capacity credits in PPAs can improve economic and financial aspects of RETs. Yet presently, the benefits of capacity credits from RETs are profitable only to the procurement operator.

A recent Energy Sector Management Assistance Programme (ESMAP) survey by the World Bank of 115 developing countries showed that 43 had IPPs [3]. However, there is evidence that presently most IPPs are primarily based on fossil fuel technologies due to barriers outlined above. This is particularly concerning given the detrimental socio-environmental consequences of fossil fuel combustion. Wamukonya reports that recent IPPs in Kenya, Thailand and Morocco are primarily based on fossil fuels, especially coal [8]. In Puerto Rico IPPs are shifting oil dependency towards a more balanced range of energy dependent imports including coal and gas and are substantially contributing to overall power generation [62].

Another power sector survey in the Caribbean conducted by the author support Wamukonya's findings that present PPA regulation is insufficient to attract RET development but instead have in some cases lead to IPPs using fossil fuel technologies. Power sector regulation in, for instance, Aruba, St Lucia and Dominica all allow contribution from IPPs. However, the existing feed-in incentives have so far only attracted independent production in Dominica based on diesel generators rather than RETs. Until recently, tax concession on imported fossil fuel in Dominica—a widespread policy in the Caribbean—has been a direct subsidy to diesel generated electricity and provided significant economic and financial advantage over power production from RETs.

However, given that incentives are set at the right level the IPPs consider RETs but presently examples where PPA frameworks have played a key role in accelerating markets for RETs are rare, and include India, Sri Lanka (wind and hydro respectively) and Mauritius (bagasse) [3,61]. Yet, it is the proliferation of RETs that harbour socio-economic and security of supply advantages, particularly in the long-run, and are unfortunately rarely realised.

5. What role for renewables?

Most SIDS are have an abundance of renewable energy resources. In the absence of domestic fossil fuels electricity production based on these energies is very costly and has strained economic development in the past. In spite of the fact that many RETs have reached technological maturity and can compete economically with traditional power generating technologies they have been rarely con-

sidered. However, planned and ongoing power sector programmes in SIDS are a formidable opportunity to provide a regulatory platform that progressively integrates RETs into the power capacity portfolio thus improving socio-environmental performance, as well as security of supply. Although, a variety of reform options exist past experience has not provided conclusive evidence which type of reform, as well as the exact nature of sequencing and execution can deliver the desired results.

Nonetheless, in light of inherent characteristics of SIDS, as well as evidence from recent power sector reform programmes—some of which had been in SIDS—several recommendations can be made that should significantly enhance the opportunities for power generation from RETs without compromising economic production. Based on the discussion presented in this paper, reform programmes ought to harmonise aspects of market governance, strengthen human capacity, consider national long-term interests and make the appropriate choice between several power sector reform options.

As regards market governance, imperfections and distortions need to be removed. Presently, energy policies in SIDS provide direct and indirect support to fossil fuel based power technologies, for instance through exemptions from income or gross-revenue tax, exclusion from fuel taxation and import duties, as well as providing operating subsidies or cross subsidising power customers. These protective policies not only limit the uptake of RETs but also weaken the economy through misallocation of investments and inefficiencies in consumption. However, the fundamental prerequisite of creating policies that would allow RETs to compete on equal footing, as well as a power sector that is able to execute available options, requires strengthening of human capacity of both the electricity industry and governmental bodies. Presently, the lack of expertise poses a serious barrier to analytically and strategically assess RETs for power capacity expansion. Although cost efficiency objectives are important for economic development, power sector reform programmes often neglect equally important social and environmental objectives. New regulatory frameworks must therefore incorporate equal indicators for all power technologies reflecting long-term interests of society. This needs to be mandated in national regulations, particularly in a privatised environment as capacity expansion undertaken under corporate short-term commercial objectives gives little consideration to long-term national interests.

Making the right choice for power sector reform is crucial. Although, aggregate demand in SIDS is insufficient to provide a platform for competition in bulk power generation and retail the question whether or not privatisation or simply commercialisation is the better reform programme is open to debate. In any case, commercialisation can precede privatisation and allows analytical review whether or not further reform programmes are necessary at a later stage. Therefore reform should be executed in a sequence that allows full control of the process, as well as providing sufficient time to consider and fully incorporate aspects of market governance and human capacity. However, the need for quick reform is often pressing due to severe financing difficulties and as a consequence reform steps, particularly privatisation, are executed without careful consideration given to long-term implications. Privatisation of the power sector is neither solely a matter of remedying internal

financial inability to service energy demand nor is it necessarily a voluntary action by decision makers but also crucially forced by international lending institutions. Yet there appears to be insufficient evidence that private participation actually improves economic efficiency in power production. Equally, evidence indicates that privatisation of power sector assets does not significantly reduce budgetary pressures. Therefore it is desirable that international lending institutions restructure their lending conditions so that privatisation of power sector assets remains a choice rather than inevitability. Ideally, international lending bodies and governmental entities should jointly seek a solution that is best for economic development in the long term, rather than framing privatisation as a panacea to rehabilitate the power sector and to lift some pressure from budgetary deficits.

Another strategy of providing incentives for private sector participation in a state controlled but commercialised power sector is the introduction of PPAs. This can potentially provide a competitive platform for power generation from RETs to contribute to national production even in SIDS. However, in the past several critical problems have surfaced with regards to IPPs and PPAs. Some measurers have been outlined to remedy these flaws, such as considering capacity credit and equal environmental performance indicators across all generating technologies. But particularly the provision of long-term stable feed-in tariffs in economies with weak currencies can constitute a considerable risk to both foreign investors and the power utility in the presence of significant variations in both the utilities own fuel prices and the country's currency value [4].

Overall, there is insufficient evidence that privatisation and/or IPPs alone can stimulate the uptake of RETs in SIDS. There is also no conclusive evidence that it significantly strengthens economic development. However, full commercialisation of state-enterprises can ensure economic production as well as considering the steady introduction of RETs in order to meet socio-environmental, as well as security-of supply objectives. This can be enacted without the need for over-complicated regulation, that might otherwise alienate private investors in small economic markets. In addition, reversing privatisation and foreign control is complicated and can discourage foreign direct investment in the long-run. On the basis of the arguments presented in this discussion full privatisation of the power sector can not be encouraged. Although the introduction of PPAs/IPPs provide an intermediate solution/step to private participation with the potential to attract RET development if past problems are sufficiently remedied.

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